

CBCS SCHEME

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Third Semester B.E. Degree Examination, Jan./Feb. 2023 Analog Electronic Circuits and Op-Amps

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- The parameters of voltage Divider Biasing circuit are as $V_{CC} = 16V$, $R_1 = 62K\Omega$, $R_2 = 9.1K\Omega$, $R_c = 3.9K\Omega$, $R_E = 680\Omega$, $\beta = 80$ and $V_{BE} = 0.7V$. Find the quiescent base current, collector current and V_{CE} . Also determine the values of collector voltage, Emitter voltage and base voltage with respect to ground. (12 Marks)
 - Draw and explain the working of clamper circuit which clamps the positive peak of a signal to zero. (08 Marks)

OR

- Derive the expression for stability factor for voltage Divider Biasing circuit with respect to I_{CO} and V_{BE} . (10 Marks)
 - Derive an expression for input impedance, output impedance, current gain and voltage gain for Emitter follower configuration. (10 Marks)

Module-2

- Explain the need of cascading Amplifier. Draw and explain the block diagram of three stage cascade amplifier. (08 Marks)
 - For the voltage series feedback Amplifier, derive an expression for transfer gain, input resistance and output resistance. (12 Marks)

OR

- The parameters of Darlington Emitter follower configuration are as $V_{CC} = 18V$, $R_B = 3.3\mu\Omega$, $R_E = 390\Omega$, $r_i = 5K\Omega$, $\beta_D = 8000$ and $V_{BE} = 1.6V$. Calculate Input and output impedances, voltage gain and current gain. Also draw its circuit diagram, Also find V_0 for $V_i = 120mV$. (12 Marks)
 - For the current shunt feedback amplifier, derive an expression for Input resistance and output resistance. (08 Marks)

Module-3

- Explain the operation of class B pushpull amplifier. Prove that the maximum efficiency of class B configuration is 78.5%. (10 Marks)
 - With neat circuit diagram, explain working and characteristics of N-channel JFET. (10 Marks)

OR

- Explain the operation of Class A transformer coupled power amplifier and prove that the maximum efficiency is 50%. (10 Marks)

- b. With the help of neat diagrams, explain the construction, working and characteristics of N-channel Depletion type MOSFET. (10 Marks)

Module-4

- 7 a. Design an active high pass filter to meet the following specification
 i) Butterworth response
 ii) Cutoff frequency = 6KHz and use $C_2 = C_3 = C = 1000\text{PF}$
 iii) Decay rate in the stop band = 40dB/decade
 Also draw the designed circuit diagram. (10 Marks)
- b. Draw the practical voltage regulator using LM337 and justify the use of each component. Write three applications of IC LM337. (10 Marks)

OR

- 8 a. Design a second order low pass filter for cut-off frequency of 100Hz and draw its circuit diagram. (10 Marks)
- b. What is Instrumentation Amplifier? Find the expression for output of three op-amp instrumentation Amplifier. (10 Marks)

Module-5

- 9 a. Design the capacitor coupled zero crossing detector using op-amp 741 having $I_{B(\text{max})} = 500\text{nA}$ and minimum signal frequency is 500Hz. The supply voltages are $\pm 12\text{V}$. Also draw the design circuit. (12 Marks)
- b. Sketch the circuit of triangular/rectangular waveform generator. Draw the output waveforms from the circuit and explain its operation. (08 Marks)

OR

- 10 a. Design an inverting Schmitt trigger to have trigger voltages of $\pm 4\text{V}$. Use op-amp 741 with supply of $\pm 15\text{V}$. Draw the designed circuit. Write three differences between Schmitt trigger and comparator. (12 Marks)
- b. Sketch the circuit of sawtooth wave generator. Draw its waveforms and explain its operation. (08 Marks)
